

Comment on hess-2022-216

Timothy Lahmers (Referee)

Referee comment on "Understanding the diurnal cycle of land–atmosphere interactions from flux site observations" by Eunkyo Seo and Paul A. Dirmeyer, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-216-RC2>, 2022

This manuscript will be a major contribution to the hydrometeorology community due to its thorough review of land-atmosphere interactions based on flux tower measurements. The authors demonstrate how fluxes between the land surface and the atmosphere change throughout the diurnal cycle, and they show how these processes differ in water-limited and energy-limited environments. As there are still some content and technical issues with this manuscript, I recommend that this manuscript be accepted with major revisions.

Major Comments:

1) Section 3.1: When analysis days were selected, major precipitation events were removed based on daily soil moisture tendencies. Is the 2-standard deviation threshold in soil moisture tendencies, for removing precipitation days from the analysis, sufficient? This method could still theoretically be affected by convection, especially in more arid environments where deep convection may occur even if rainfall is relatively light.

2) Section 3.4: The authors selected a method to separate water and energy-limited environments using a correlation between soil water content and evaporative fraction. Could the authors provide prior literature or observation data to justify this method? Has this selection method been compared to other widely used proxies for aridity, such as the Budyko curve?

3) Section 5: The findings of this paper are important for both the atmospheric modeling and observation applications of the PBL community. I would suggest that the conclusions include a more substantial discussion of the implications of this work for future atmospheric model development, such as for PBL parameterizations in mesoscale models. Also, consider breaking section 5 up into two sections. Lines 400-478 are more of a

summary, while lines 479-499 are more of a discussion about the significance and potential for future work based on these results. These new sections could be broken up accordingly.

Technical/Minor Comments:

The figures provide useful information to the readers; however, the labels and values shown on the x and y-axis are relatively small and difficult to read. Consider revising the figures to make key values for the reader more legible.